a
ab
ad
b
bae

bba
bbc
bbcc
bc
bca

bcc
bcca
c
ca
caab

caad
caaf
cab
cad
cc

ce

FIG. 1

LIST OF PREFIXES

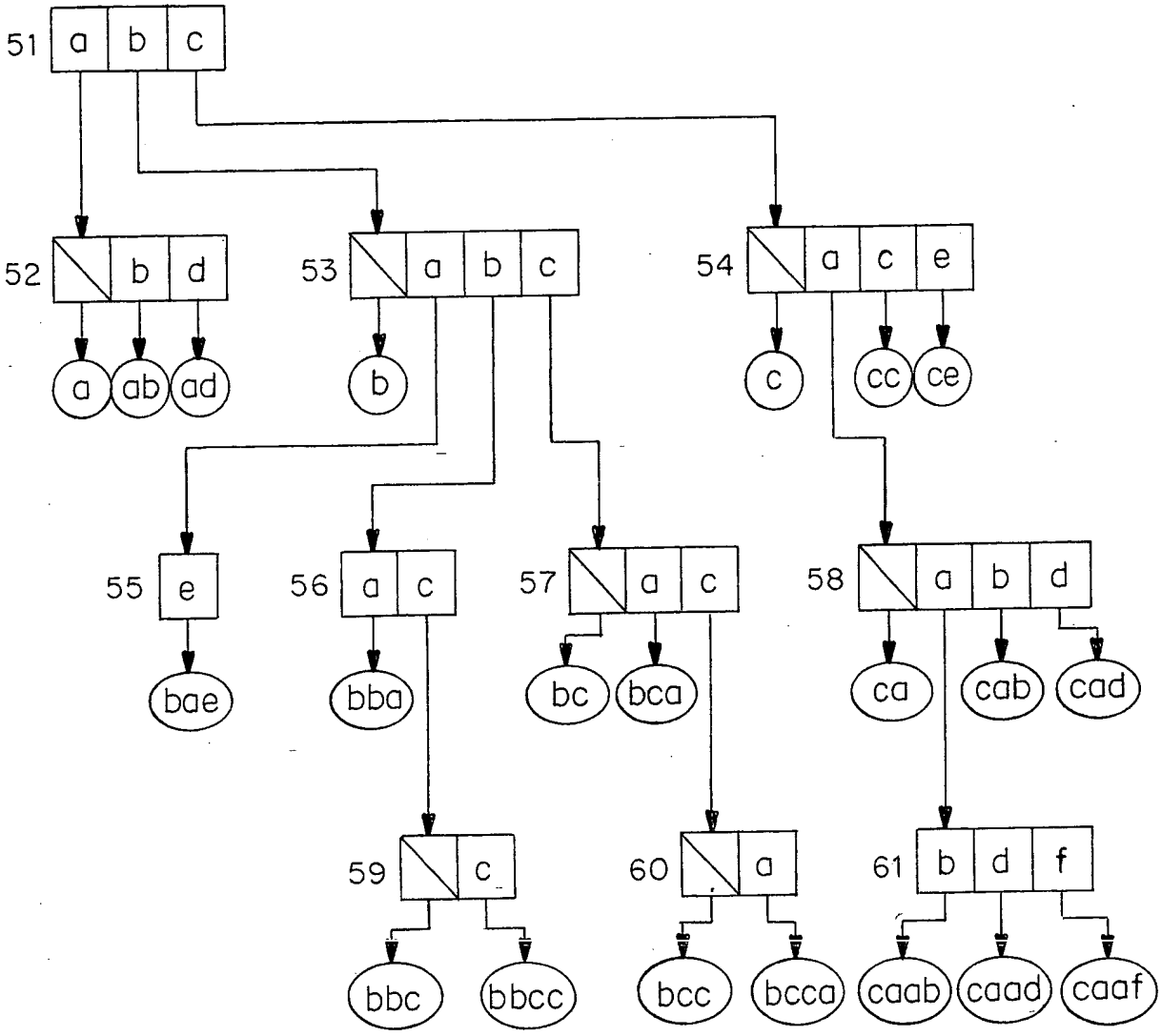

FIG. 2
(Prior Art)
TRIE STRUCTURE

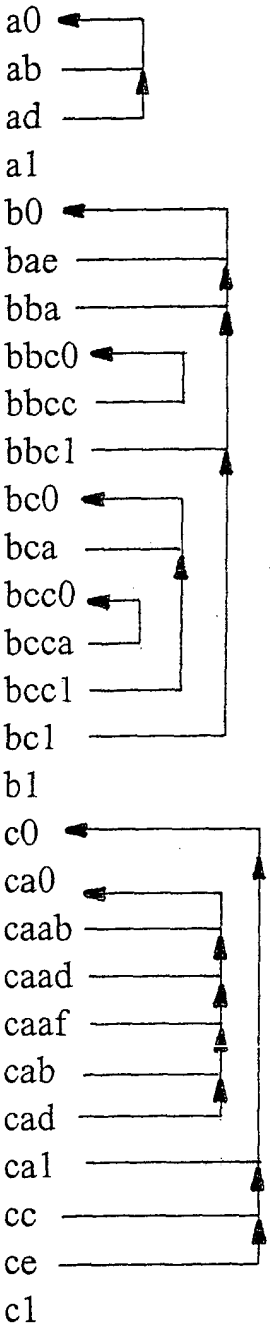

FIG. 3
(Prior Art)
LIST OF PREFIXES

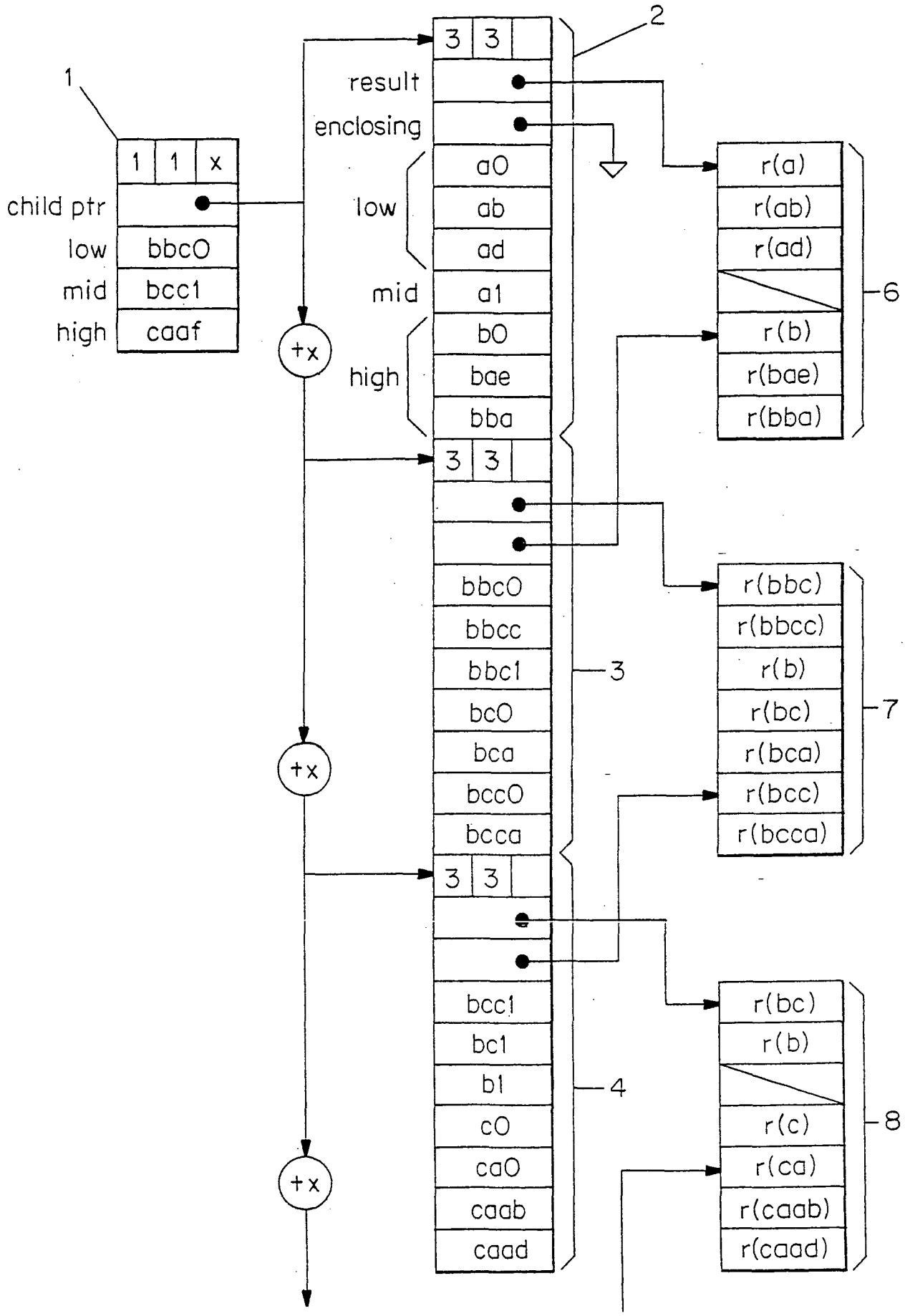
1
1
1
x
child ptr
low
bbc0
mid
bcc1
high
caaf
+x
+x
+x
2
3
3
result
enclosing
low
a0
ab
ad
mid
a1
high
b0
bae
bba
r(a)
r(ab)
r(ad)
r(b)
r(bae)
r(bba)
6
3
3
bbc0
bbcc
bbc1
bc0
bca
bcc0
bcca
r(bbc)
r(bbcc)
r(b)
r(bc)
r(bca)
r(bcc)
r(bcca)
7
3
3
bcc1
bc1
b1
c0
ca0
caab
caad
4
r(bc)
r(b)
r(c)
r(ca)
r(caab)
r(caad)
8

FIG. 4A

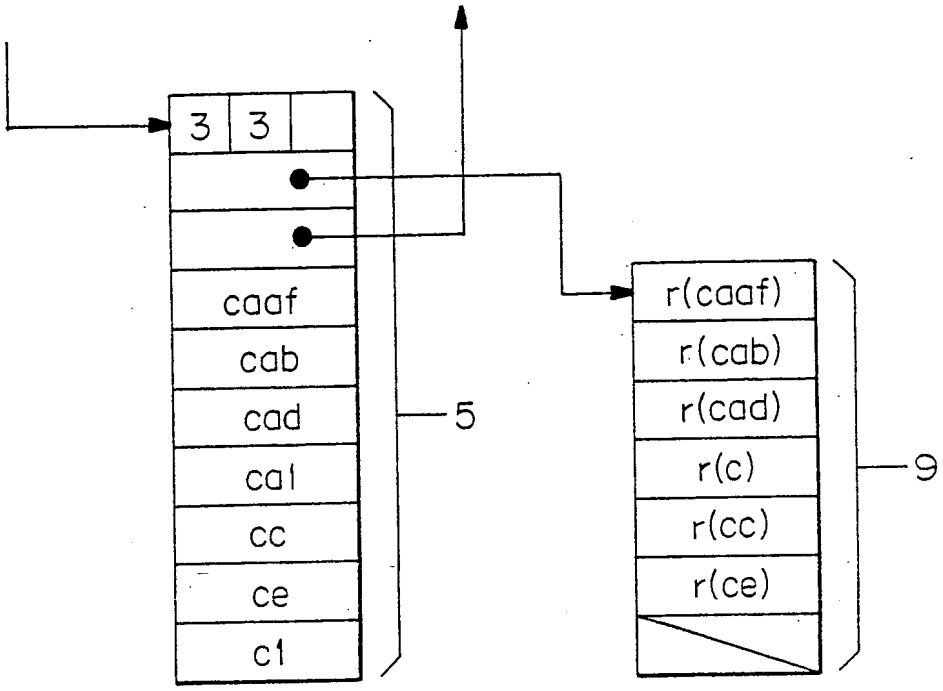

FIG. 4B

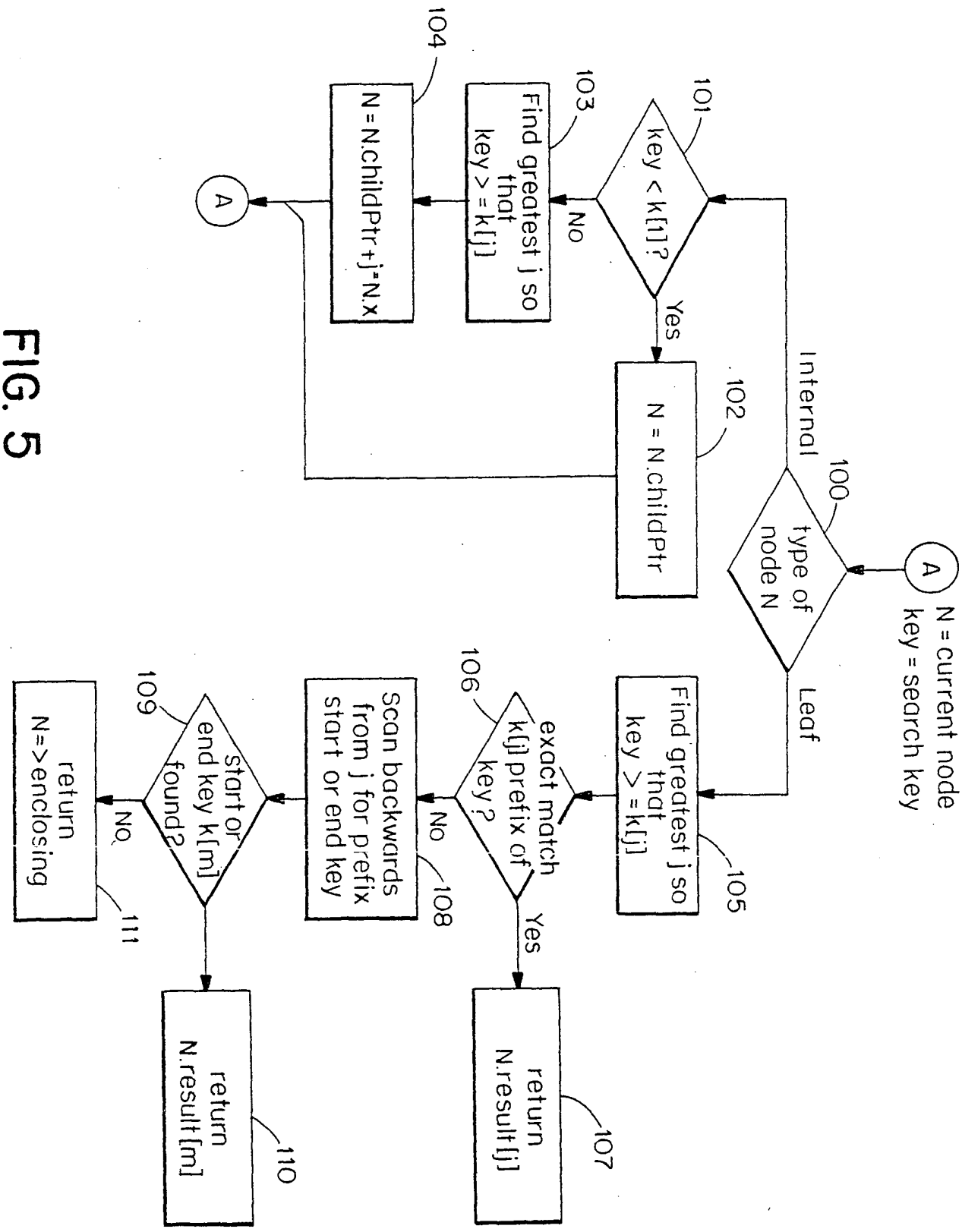
A
N = current node
key = search key
100
type of node N
Internal
Leaf
101
key < k[1] ?
Yes
No
102
N = N.childPtr
103
Find greatest j so that key >= k[j]
104
N = N.childPtr+j*N.x
A
105
Find greatest j so that key >= k[j]
106
exact match k[j] prefix of key ?
Yes
No
107
return N.result[j]
108
Scan backwards from j for prefix start or end key
109
start or end key k[m] found?
No
110
return N.result[m]
111
return N=>enclosing

FIG. 5

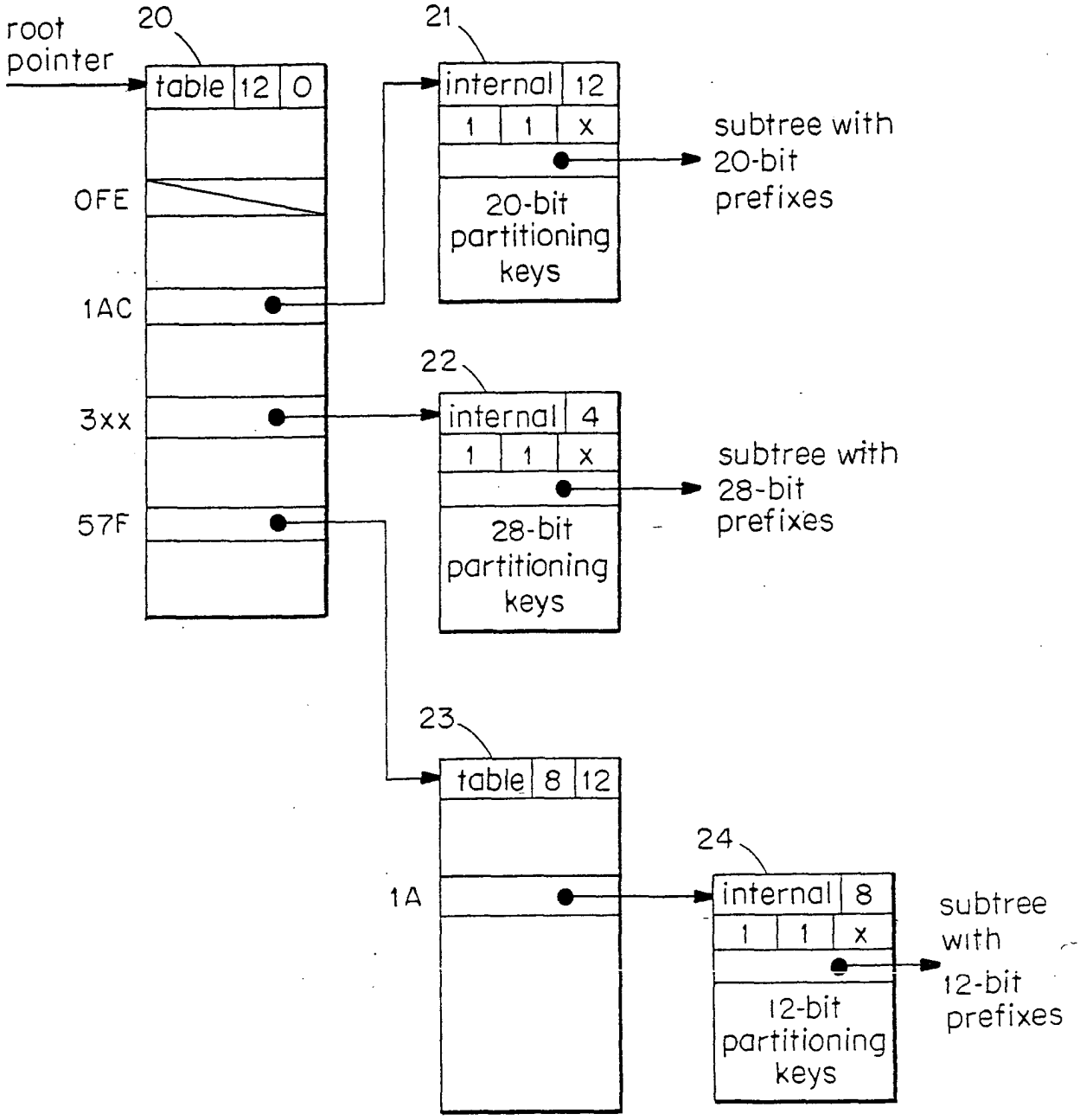
root pointer
20
table 12 0
0FE
1AC
3xx
57F
21
internal 12
1 1 x
20-bit partitioning keys
subtree with 20-bit prefixes
22
internal 4
1 1 x
28-bit partitioning keys
subtree with 28-bit prefixes
23
table 8 12
1A
24
internal 8
1 1 x
12-bit partitioning keys
subtree with 12-bit prefixes

FIG. 6

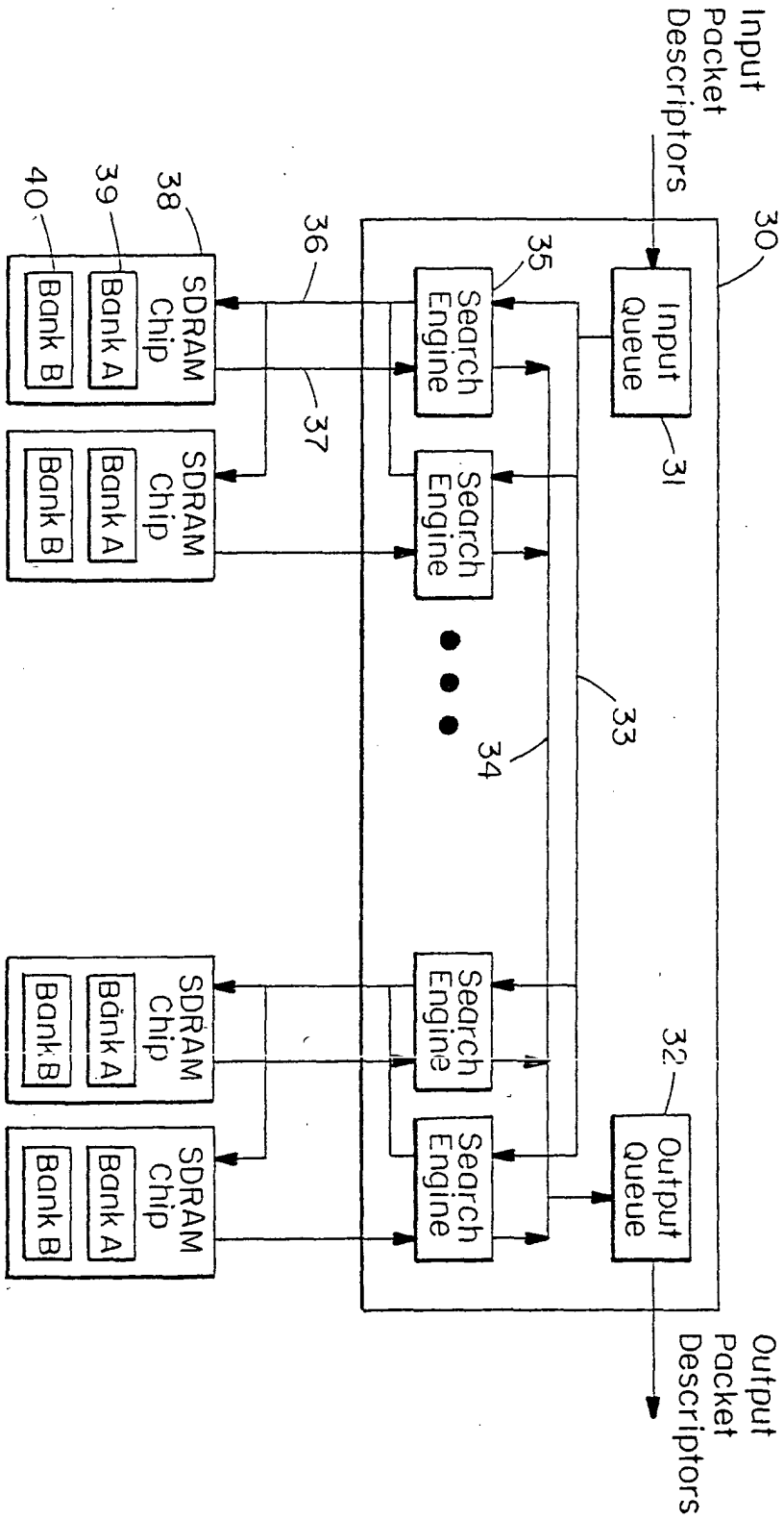
Input Packet Descriptors
30
Input Queue
31
Search Engine
35
Search Engine
Search Engine
Search Engine
Search Engine
33
34
36
37
SDRAM Chip
Bank A
Bank B
38
39
40
SDRAM Chip
Bank A
Bank B
SDRAM Chip
Bank A
Bank B
SDRAM Chip
Bank A
Bank B
32
Output Queue
Output Packet Descriptors

FIG. 7

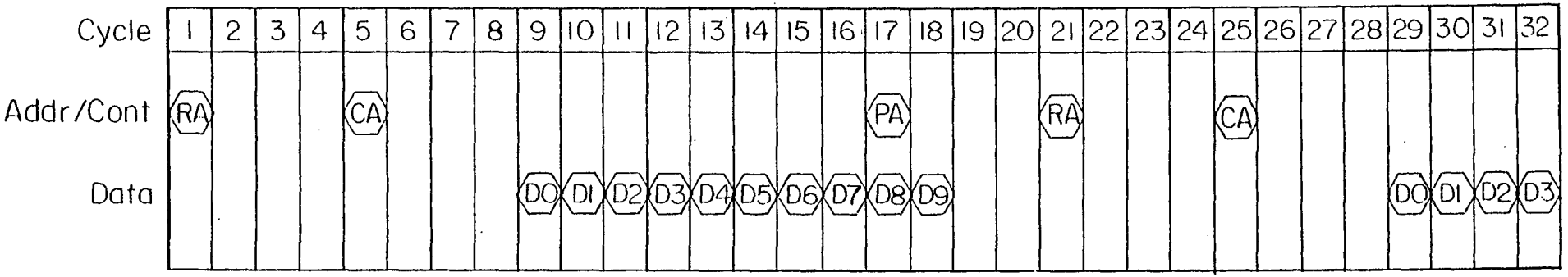

FIG. 8

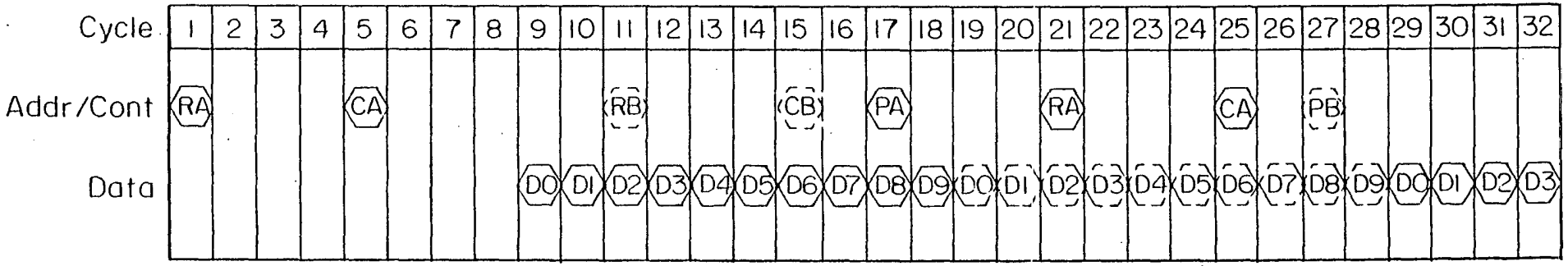

FIG. 9

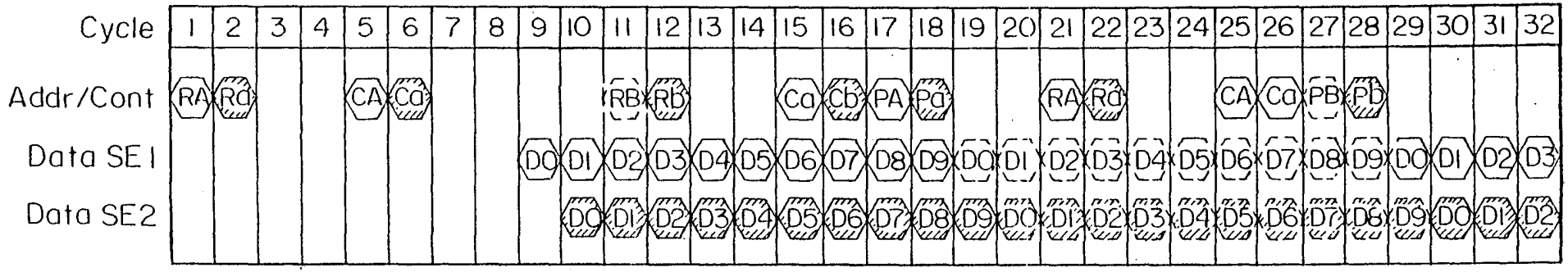

FIG. 10

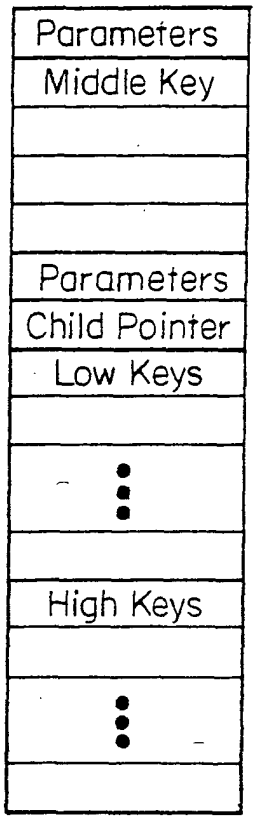
Parameters
Middle Key
Parameters
Child Pointer
Low Keys
High Keys

FIG. 11

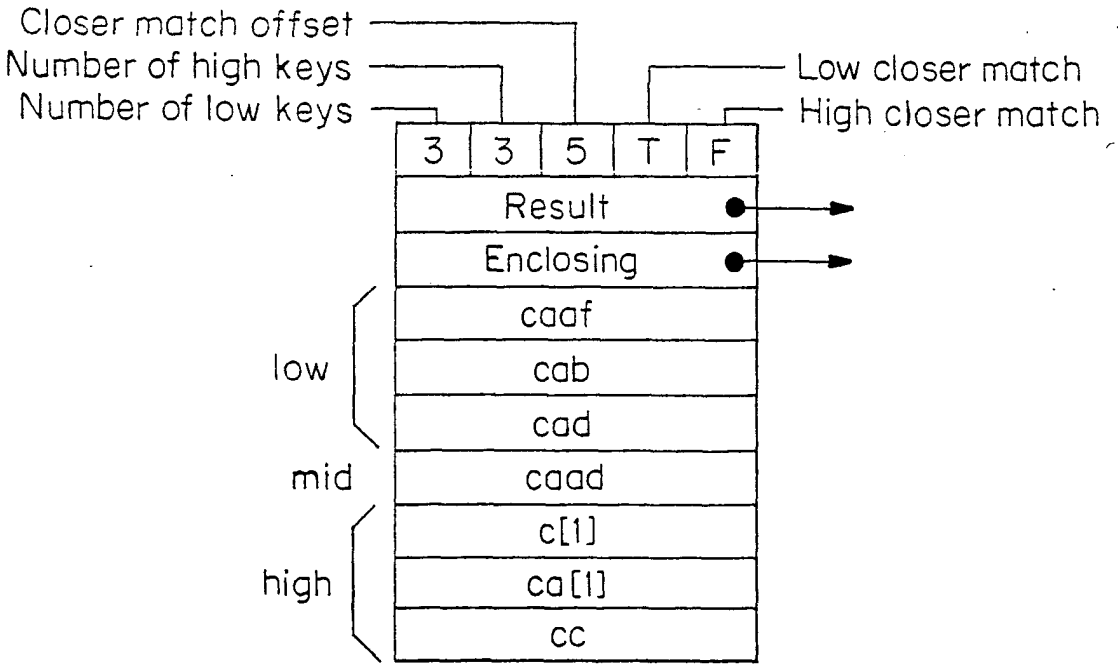
Closer match offset
Number of high keys
Number of low keys
Low closer match
High closer match
3
3
5
T
F
Result
Enclosing
low
caaf
cab
cad
mid
caad
high
c[1]
ca[1]
cc

FIG. 12

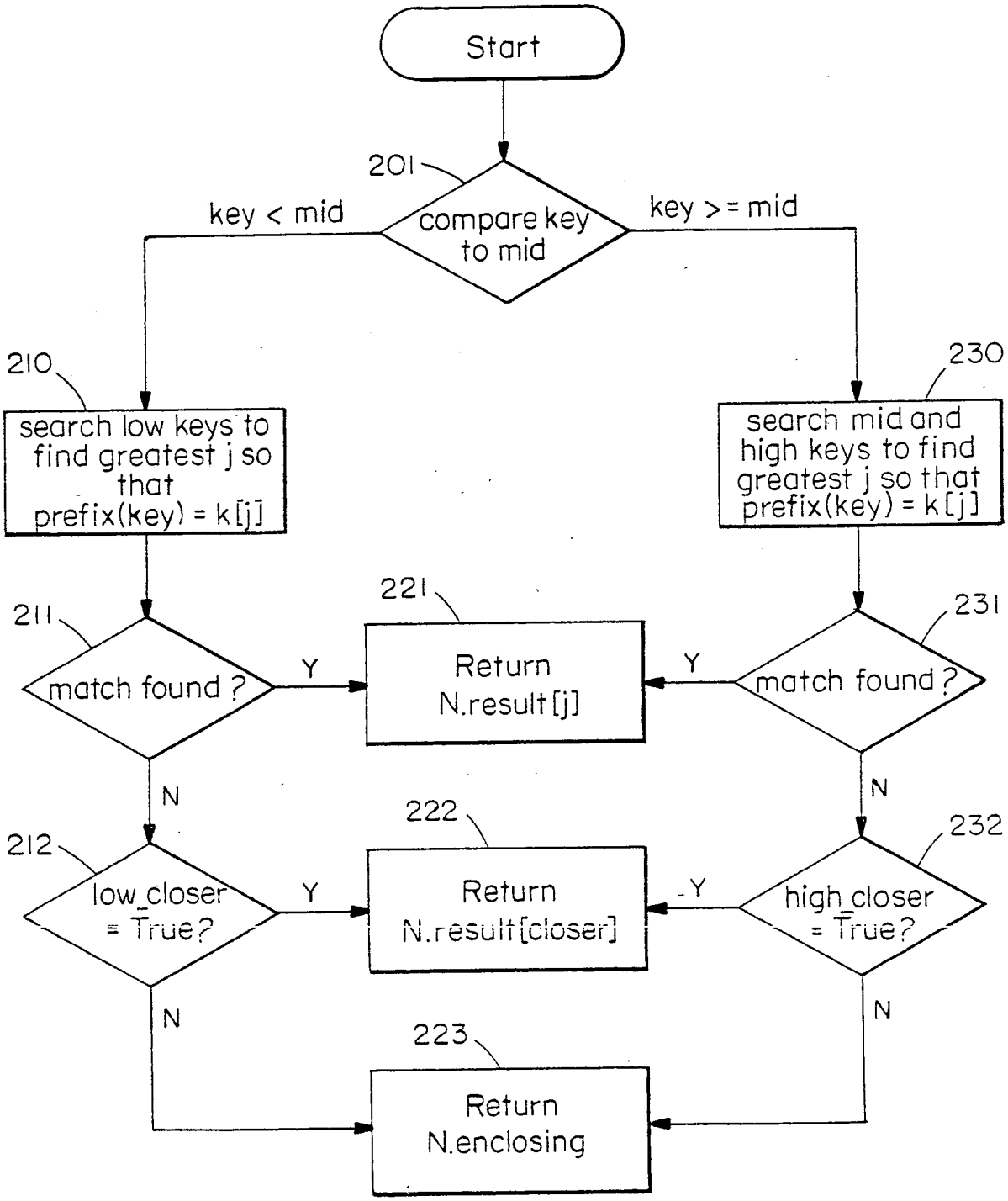
Start
201
compare key to mid
key < mid
key >= mid
210
search low keys to find greatest j so that prefix(key) = k[j]
230
search mid and high keys to find greatest j so that prefix(key) = k[j]
211
match found ?
Y
221
Return N.result[j]
Y
231
match found ?
N
N
212
low_closer = True?
Y
222
Return N.result[closer]
Y
232
high_closer = True?
N
N
223
Return N.enclosing

FIG. 13

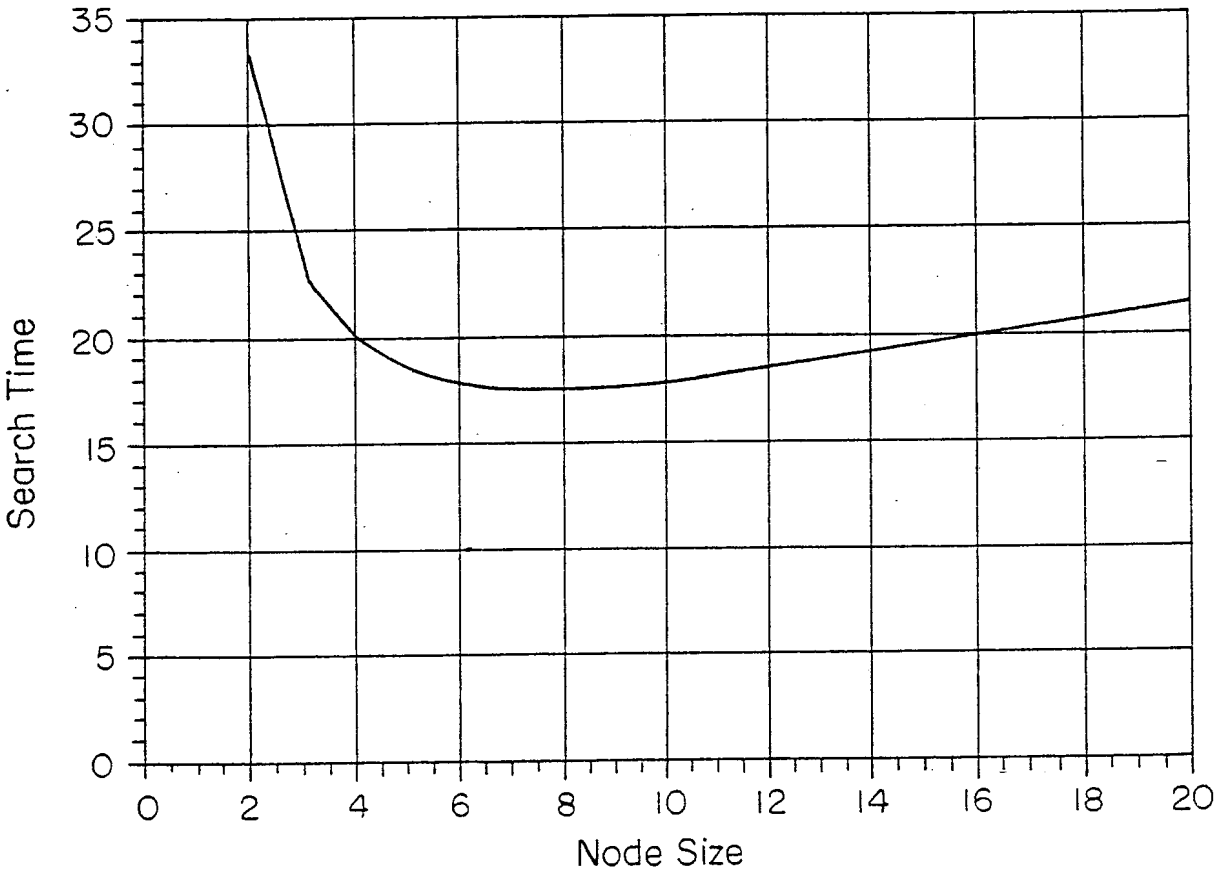

FIG. 14

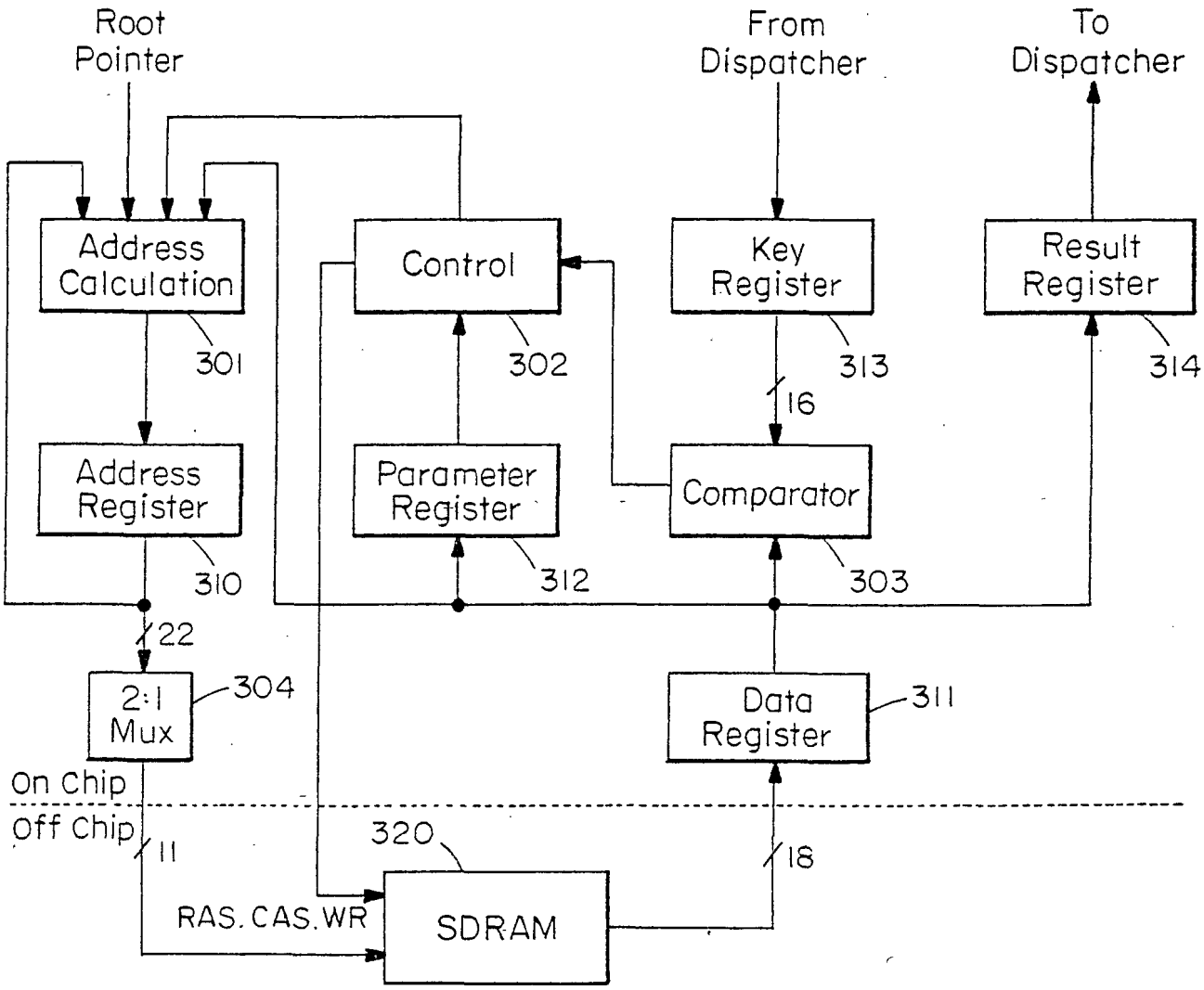
Root Pointer
From Dispatcher
To Dispatcher
Address Calculation
301
Control
302
Key Register
313
16
Result Register
314
Address Register
310
Parameter Register
312
Comparator
303
22
2:1 Mux
304
Data Register
311
On Chip
Off Chip
11
320
18
RAS. CAS. WR
SDRAM

FIG. 15